行政院國家科學委員會專題研究計畫成果報告

Non-abelian Chern-Simons Higgs 系統中

BPS Domain Walls 之研究

計畫編號：NSC 87-2112-M-032-002
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一、中文摘要

在國科會的資助下，我完成了以下工作：

1. Hsien-chung Kao, S.-C. Lee, and W.-J. Tzeng, 1997, " Farey Tree and the Frenkel-Kontorova Model, " Phys. Rev. E55, pp. 2628-2631.

2. Hsien-chung Kao, S.-C. Lee, and W.-J. Tzeng, 1997, " Frenkel-Kontorova Model with Pinning Cusps, " Physica D107, pp. 30-42.

3. Hsien-chung Kao, 1998, "Non-abelian Chern-Simons Coefficient in the Higgs Phase,", Phys. Rev. **D57**, pp. 7416-7421.

其中在第三個工作裡，我們計算了 Yang-Mills Chern-Simons Higgs 理論中 Higgs 相的 one loop Chern-Simons 係數。

關鍵詞：Frenkel Kontorova 模型，Chern-Simons 理論

Abstract

With the support from the National Science Council, I finished the following works:

1. Hsien-chung Kao, S.-C. Lee, and W.-J. Tzeng, 1997, " Farey Tree and the Frenkel-Kontorova Model, " Phys. Rev. E55, pp. 2628-2631.

2. Hsien-chung Kao, S.-C. Lee, and W.-J. Tzeng, 1997, " Frenkel-Kontorova Model with Pinning Cusps, " Physica D107, pp. 30-42.

3. Hsien-chung Kao, 1998, "Non-abelian Chern-Simons Coefficient in the Higgs Phase,", Phys. Rev. **D57**, pp. 7416-7421.

In the thied work, I calculate the one loop corrections to the Chern-Simons coefficient κ in the Higgs phase of Yang-Mills Chern-Simons Higgs theories.

Keywords: Frenkel Kontorova Model, Chern-Simons Theories

二、成果及討論

When the gauge group is SU(N), we show, by taking into account the effect of the would be Chern-Simons term, that the corrections are always integer multiples of $1/(4\pi)$, as they should for the theories to be quantum-mechanically consistent. In particular, the correction is vanishing for SU(2). The same method can also be applied to the case that the gauge group is SO(N). The result for SO(2) agrees with that found in the abelian Chern-Simons theories. Therefore, the calculation provides with us a unified understanding of the quantum correction to the Chern-Simons coefficient. The result clarifies the confusion that the corrections to the Chern-Simons coefficient dose not satisfy the quantization condition when the gauge symmetry is completely broken.

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